



TO: John Martin, SE Texas GCD – Chair  
Gary Ashmore, Lower Trinity GCD  
Zach Holland, Bluebonnet GCD  
Beverly Hopkins, Brazoria County GCD  
Sarah Kouba, Lonestar GCD

*Via email*

August 11, 2026

RE: Public Comments on Proposed DFCs – Harris-Galveston Subsidence District

Dear GMA-14 Members,

The Harris-Galveston Subsidence District (HGSD) appreciates the opportunity to comment on the proposed desired future conditions (DFCs) and associated groundwater pumping scenarios developed for the 2026 Joint Planning Process for Groundwater Management Area 14 (GMA 14). Thank you to all the participating member Districts and your staff for working to support our regional water plan.

Our region has relied on groundwater pumped from the Gulf Coast Aquifer System. However, data show that the sustained development of this groundwater resource results in permanent compaction of the aquifer material, causing reduced well yields and the sinking of the land surface known as subsidence. Given our region's frequent episodes of heavy rainfall, tropical storms and hurricanes, any permanent loss of land elevation can have serious consequences, which is why the Texas Legislature created the Harris-Galveston Subsidence District (HGSD) in 1975 to provide groundwater regulation in Harris and Galveston counties to prevent further subsidence.

The HGSD began groundwater regulation near the coast, and as this area transitioned to surface water to reduce reliance on groundwater, subsidence rates were significantly lowered. However, in the developing inland areas that still relied on groundwater as their primary water source, subsidence rates began to increase, leading to groundwater reduction requirements for northern and western Harris County and the creation of the Fort Bend Subsidence District (FBSD). Both Subsidence Districts work together to reduce reliance on groundwater to prevent further subsidence; however, regional collaboration is vital to this progress, as the Gulf Coast Aquifer System is shared by many neighboring counties, including all entities within the GMA-14 planning group. [Data indicates that subsidence is occurring beyond Subsidence District's jurisdictions, with recorded subsidence in Brazoria County, Chambers County, Liberty County, Montgomery County, and Waller County.](#)

Because the decisions made by the GMA-14 planning group will affect our shared aquifer, the Subsidence Districts have been dedicated to providing as much assistance as possible. Historically, the HGSD and FBSD collaborated with the GMA-14 planning group through interlocal agreements, which allowed the Subsidence Districts the ability to cooperate on conducting research studies in support of regional planning. In this most recent round of planning, GMA-14 did not allow for an interlocal participant agreement with HGSD, FBSD, Washington County, or



other areas not covered by a Chapter 36 District. This denial determined that the only way the Subsidence Districts could collaborate with the GMA-14 planning group would be the same level of participation as the general public, through public comment.

As part of HGSD and FBSD's Joint Regulatory Plan Review (JRPR) process, the Subsidence Districts worked with the U.S. Geological Survey (USGS) and the Texas Water Development Board (TWDB) to develop the Gulf Coast Land Subsidence and Groundwater Flow (GULF)-2023 model, which simulated the impacts of groundwater use on aquifer levels and land subsidence extending from Washington County to Newton County. The GULF-2023 model was adopted by the TWDB as the groundwater availability model for GMA-14 on February 23, 2024. A baseline scenario, B6, was created and modeled within GULF-2023 to reflect the impact of projected water demand on the Gulf Coast Aquifer System and land subsidence through the year 2100.

Based on technical evaluations that compare pumping scenarios between the GULF-2023 B6 and the "Adjusted Scenario 14.3 SD B6" proposed by GMA 14, the current proposed pumping levels represent a significant increase over previous planning cycles and projected regional demands, with measurable impacts on land subsidence. Additional information regarding this evaluation of the proposed DFC run, "Adjusted Scenario 14.3 SD B6", is provided in the sections below.

### **1. Magnitude of Pumping Increase**

The proposed "Adjusted Scenario 14.3 SD B6" establishes Montgomery County's modeled available groundwater (MAG) at a total of 199,206 acre-feet per year (AFY). This volume is approximately 2.1 times the 2021 MAG of 96,873 AFY and is two times more groundwater demand than projected by GULF-2023 B6 for earlier decades of the planning period. Specifically, the "Adjusted Scenario 14.3 SD B6" applies a constant pumping amount in all counties except Harris, Galveston, and Fort Bend counties, and for Montgomery County has groundwater demand within two percent of the demand projected in 2100 as constant pumping begins in 2030. The population projections and associated water demand, which were analyzed as part of the JRPR, were adopted by the Region H Planning Group within their 2026 Regional Water Plan.

Recent data collected by the U.S. Geological Survey show persistent water level declines in the primary water-bearing units of the Gulf Coast Aquifer in southern Montgomery County. Additionally, subsidence rates above 2.0 centimeters (cm) per year were estimated in southern Montgomery County and subsidence rates over 1.5 cm/year exist in Conroe within central Montgomery County (see attachment). Considering this information, it is unclear why the pumping increased by such a large amount for only Montgomery County in the near future.

### **2. Vertical Distribution and Model Assumptions**

The proposed pumping in Montgomery County is heavily concentrated in the deeper portions of the Gulf Coast Aquifer System. When compared to the 2021 MAG, the "Adjusted Scenario 14.3 SD B6" increases:

- Jasper Aquifer pumping from 36,028 to 95,802 AFY (a 2.7-fold increase)
- Evangeline Aquifer pumping from 39,815 to 78,911 AFY (a 2.0-fold increase)

The proposed scenario assumes an abrupt cut-over to these maximum pumping rates in 2020, which are then held constant through 2080. This contrasts with the methodology applied for the GULF-2023 baseline scenario that utilizes a gradual ramp-up aligned with projected demand growth.

### **3. Subsidence Impacts**

The modeling results indicate that the revised pumping assumptions will lead to substantially greater projected subsidence in Montgomery County and surrounding areas over the planning period. For example, when evaluating the change in pumping isolated for Montgomery County only, modeling results show over four feet of additional subsidence in southeastern Montgomery County and over one foot of additional subsidence in northern Harris County over the planning period.

Thank you for the opportunity to provide public comments on this important planning process for our region. The HGSD and FBSD value regional collaboration and are available to assist the GMA-14 planning group with data and information to better inform decisions that will impact our shared aquifer system.

Sincerely,

A handwritten signature in black ink, appearing to read "Michael J. Turco", with a stylized flourish at the end.

Michael J. Turco  
General Manager  
Harris-Galveston Subsidence District



# Groundwater Withdrawal and Land Subsidence in Harris and Galveston Counties for the 2025 Calendar Year

## EXECUTIVE SUMMARY

by  
Ashley Greuter, P.G.  
and  
Alan Hurlbert

## Executive Summary

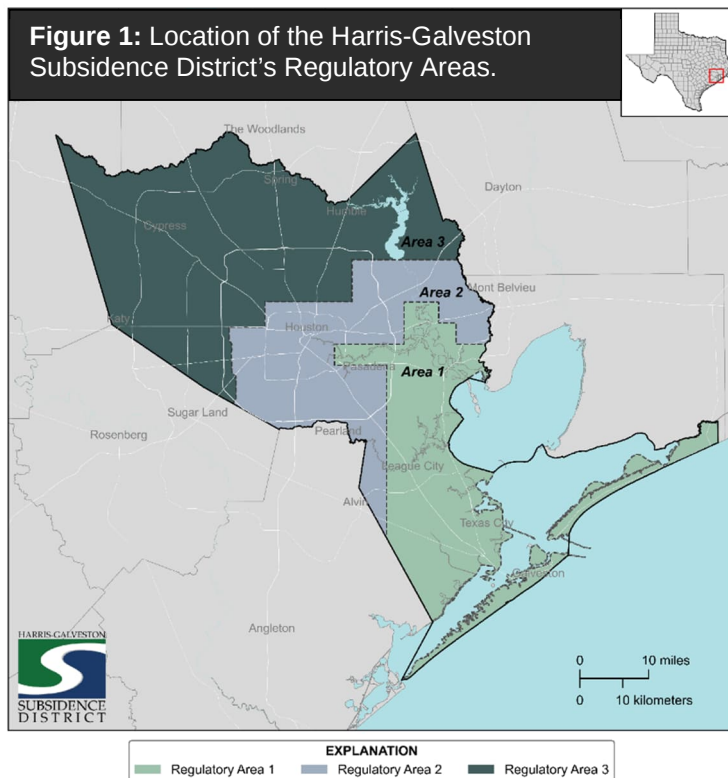
In 1975, the Texas Legislature created the Harris-Galveston Subsidence District (HGSD) to prevent further subsidence in Harris and Galveston counties. Since then, HGSD has been successful in mitigating subsidence through groundwater regulation, advanced science and research, regional collaboration, and award-winning water conservation programs. Each year, the HGSD publishes an Annual Groundwater Report to provide the latest information on subsidence in the region. A public hearing was held on April 30, 2026, at 9:00 a.m. at HGSD's office in Friendswood, TX (pursuant to HGSD Resolution No. 2026-1146 passed on February 11, 2026) to present the findings of HGSD's 50<sup>th</sup> Annual Groundwater Report for the 2025 calendar year. The executive summary provides an overview of the information presented during the public hearing.

## Description of Study Area

Harris and Galveston counties withdraw groundwater from the Gulf Coast Aquifer System, which includes two primary water-bearing units: the shallow Chicot-Evangeline (undifferentiated) aquifers and the deeper Jasper aquifer. A very small percentage of the total groundwater withdrawn within HGSD comes from the Jasper aquifer; consequently, most of the subsidence is attributable to clay compaction in the Chicot-Evangeline (undifferentiated).

HGSD uses an adaptive management strategy to prevent subsidence through a Regulatory Plan that requires permittees to convert to alternative water supplies and reduce their reliance on groundwater. The Regulatory Plan divides HGSD into three regulatory areas (**Figure 1**).

These regulatory areas share the goal of reducing overall groundwater withdrawal; however, each area's groundwater withdrawals will be reduced to a specific percentage of its total water demand by a designated date, based on the availability of alternative water supplies and water demand.



**Regulatory Area One:** No more than 10% of Total Water Demand (TWD) may be sourced from groundwater.

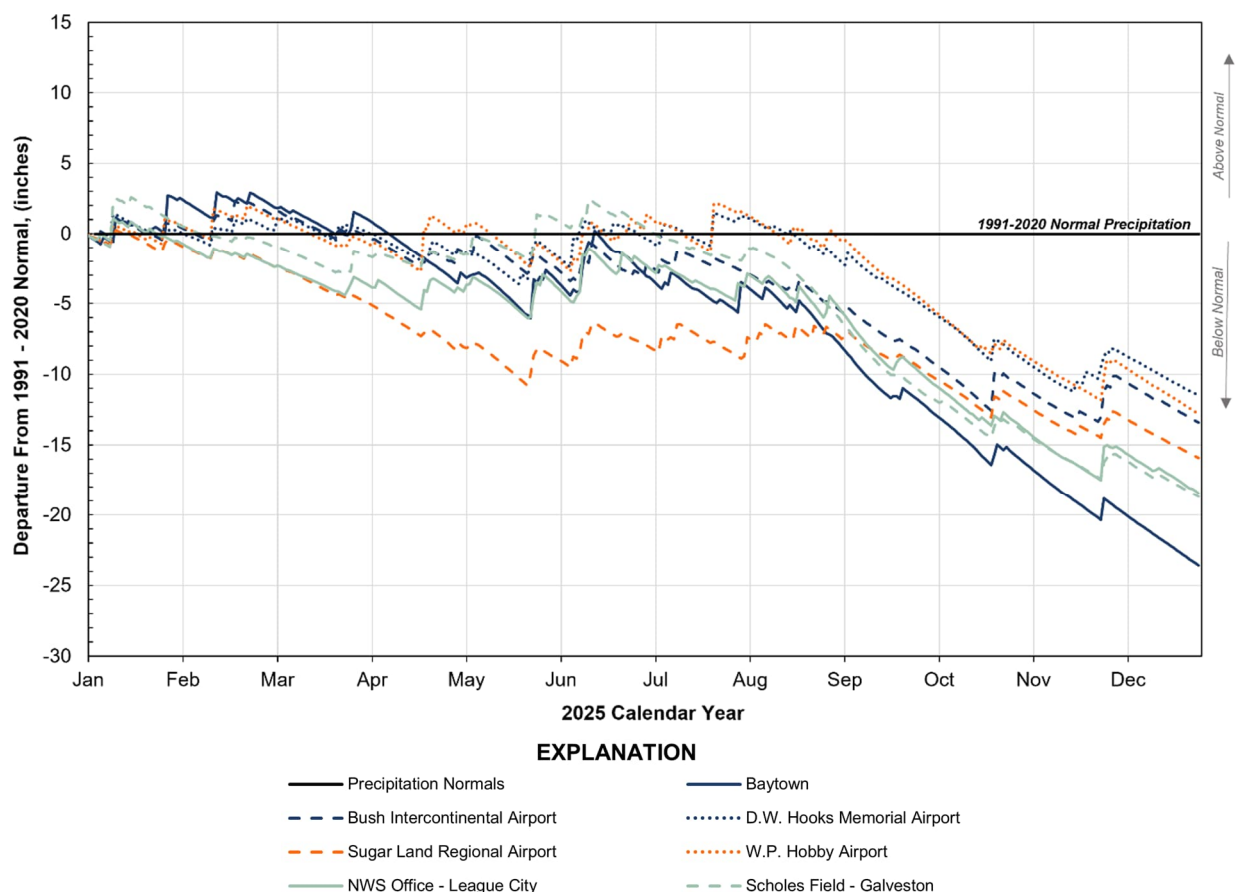
**Regulatory Area Two:** No more than 20% of TWD may be sourced from groundwater unless operating within an approved Groundwater Reduction Plan (GRP).

**Regulatory Area Three:** No more than 20% of TWD may be sourced from groundwater. Permittees operating within an approved GRP may use no more than 40% of TWD from groundwater beginning in 2025 and no more than 20% of TWD sourced from groundwater by 2035.

## Climate

Annual variations in precipitation can significantly impact the amount of water used in HGSD. For example, during periods of excessive rainfall, total water demand can decline, whereas during droughts, groundwater use can increase as surface water supplies deplete, leading to declining groundwater levels.

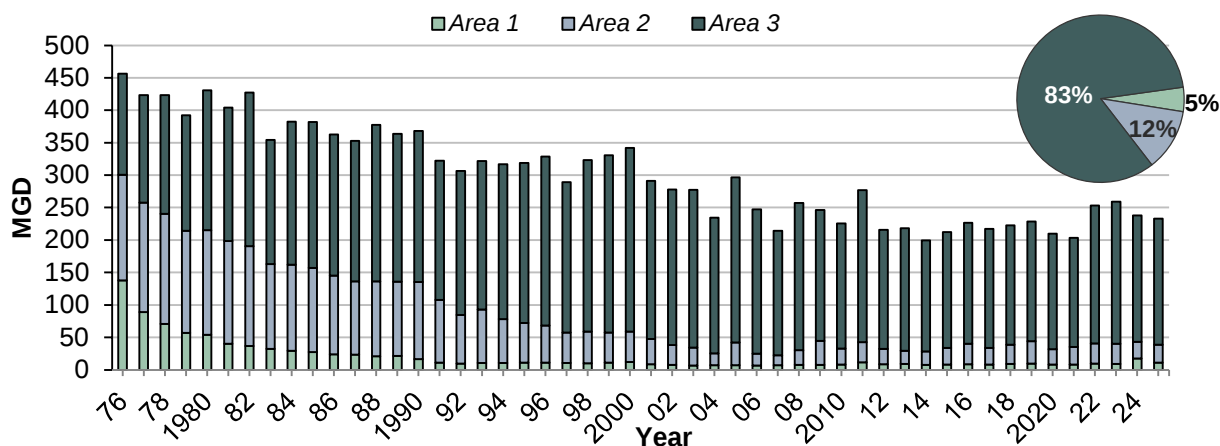
For the first half of 2025, the cumulative precipitation totals remained slightly above or below average for each station except in Sugar Land (**Figure 2**). Some minor storm events kept precipitation totals close to normal from May through July, but rainfall from these events never pushed any station more than a few inches above normal. In August, precipitation totals began to drop sharply and lasted through the remainder of the year. The greatest departure from normal was measured at the Baytown climate station, with almost 2 feet below normal (**Figure 2**).



**Figure 2:** Cumulative 2025 precipitation departure from 1991-2020 normals precipitation, in inches, at select NWS climate stations within and surrounding HGSD. Source: <https://www.ncei.noaa.gov/access>.

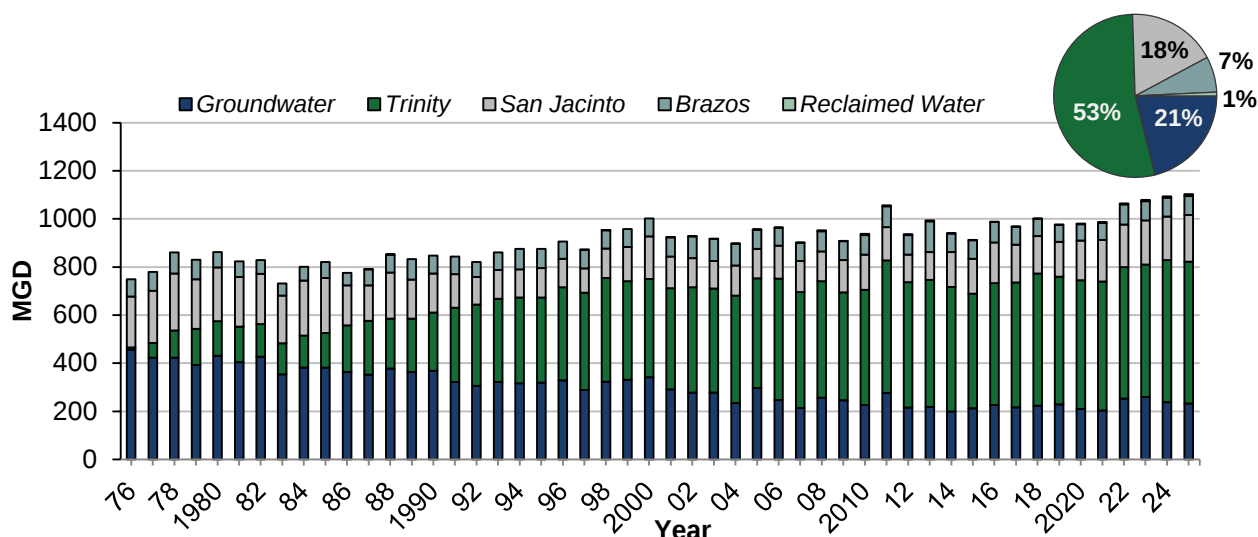
## Water Use

Each year, permittees are required to submit annual pumpage reports that include information regarding their total water demand, water use, and water supplies. The data from these reports are collected and presented in the Annual Groundwater Report. The overall groundwater use within HGSD in 2025 is 232.8 MGD, marking a 2% decrease from 2024. Approximately 83% of groundwater use within HGSD occurs in Regulatory Area Three, where the regulatory conversion timeline will not be completed until 2035 (**Figure 3**). The three primary uses of water are public supply, industrial, and irrigation. Groundwater used for public supply remains the largest category at about 212.5 MGD, accounting for approximately 91% of all groundwater used in HGSD.



**Figure 3:** Groundwater withdrawals, in million gallons per day (MGD), by regulatory area from 1976 to 2025.

The primary alternative water supply for this region is surface water from three river basins: the Brazos, San Jacinto, and Trinity. In 2025, the total alternative water used was 869.7 MGD, with the Trinity River remaining the single largest source at 68% of the total, providing about 588.5 MGD in surface water supply. Groundwater remains the second-largest source of water supply, accounting for approximately 21% of total water demand. The total water demand for HGSD was 1,102.6 MGD in 2025, which is 1% more than the previous year (**Figure 4**).

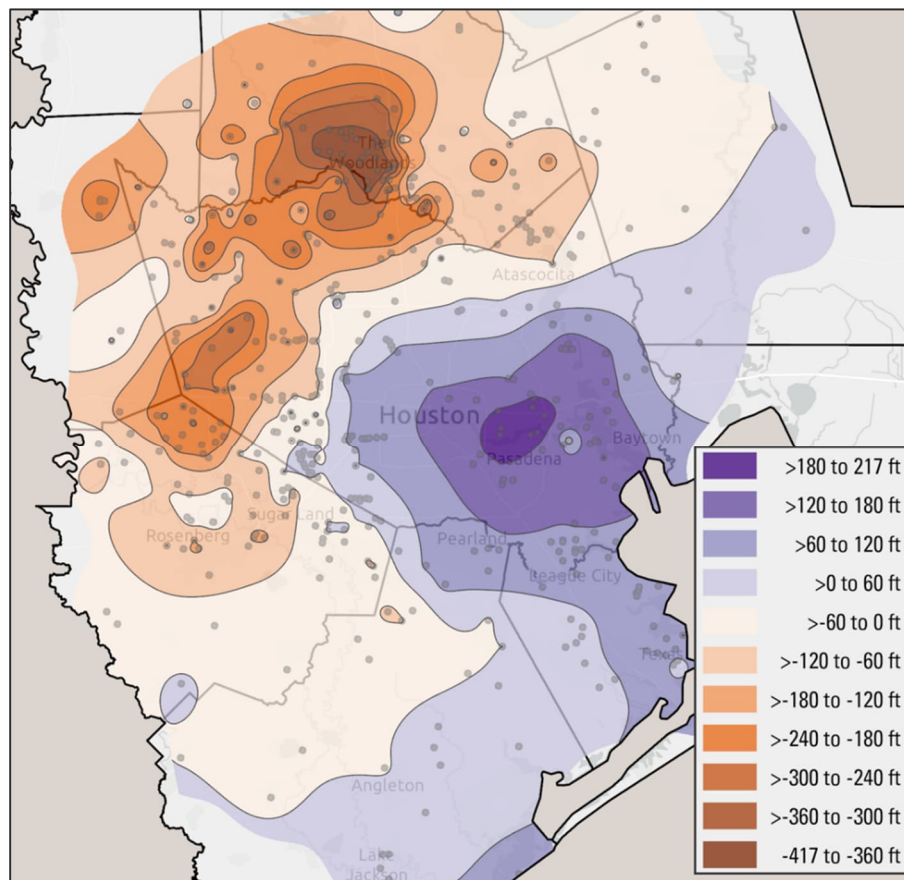


**Figure 4:** Total water use in HGSD, in million gallons per day (MGD), by source water from 1976 to 2025.

## Groundwater Levels

Since 1975, the United States Geological Survey (USGS) has measured the potentiometric water level in hundreds of wells throughout southeast Texas in cooperation with HGSD through a joint funding agreement with additional cities, subsidence districts, and groundwater conservation districts. These data are used to monitor water levels in the Chicot/Evangeline (undifferentiated) and Jasper aquifers and to evaluate historical water-level trends. Since water level is the best measure of pressure in the aquifer, this information is also crucial for understanding how groundwater pumping may depressurize the aquifer and the resulting impacts on land subsidence.

The change in water level in the Chicot-Evangeline (undifferentiated) aquifer from 1977 to 2026 highlights the impact of HGSD's regulation on the aquifer (**Figure 5**). Generally, Regulatory Areas One and Two have seen a substantial rise in water levels of over 200 feet (61 meters) in the Chicot-Evangeline (undifferentiated) aquifer, as measured in areas such as the Houston Ship Channel. The area of rise results from the reduction in groundwater use required by HGSD's Regulatory Plan. Conversely, in Regulatory Area Three, water levels were consistently lower than the 1977 benchmark levels, with declines of over 300 feet (91 meters) in the Chicot-Evangeline (undifferentiated) aquifer. The greatest historical declines in water level were measured in south-central Montgomery County, with over 400 feet (122 meters) around The Woodlands.

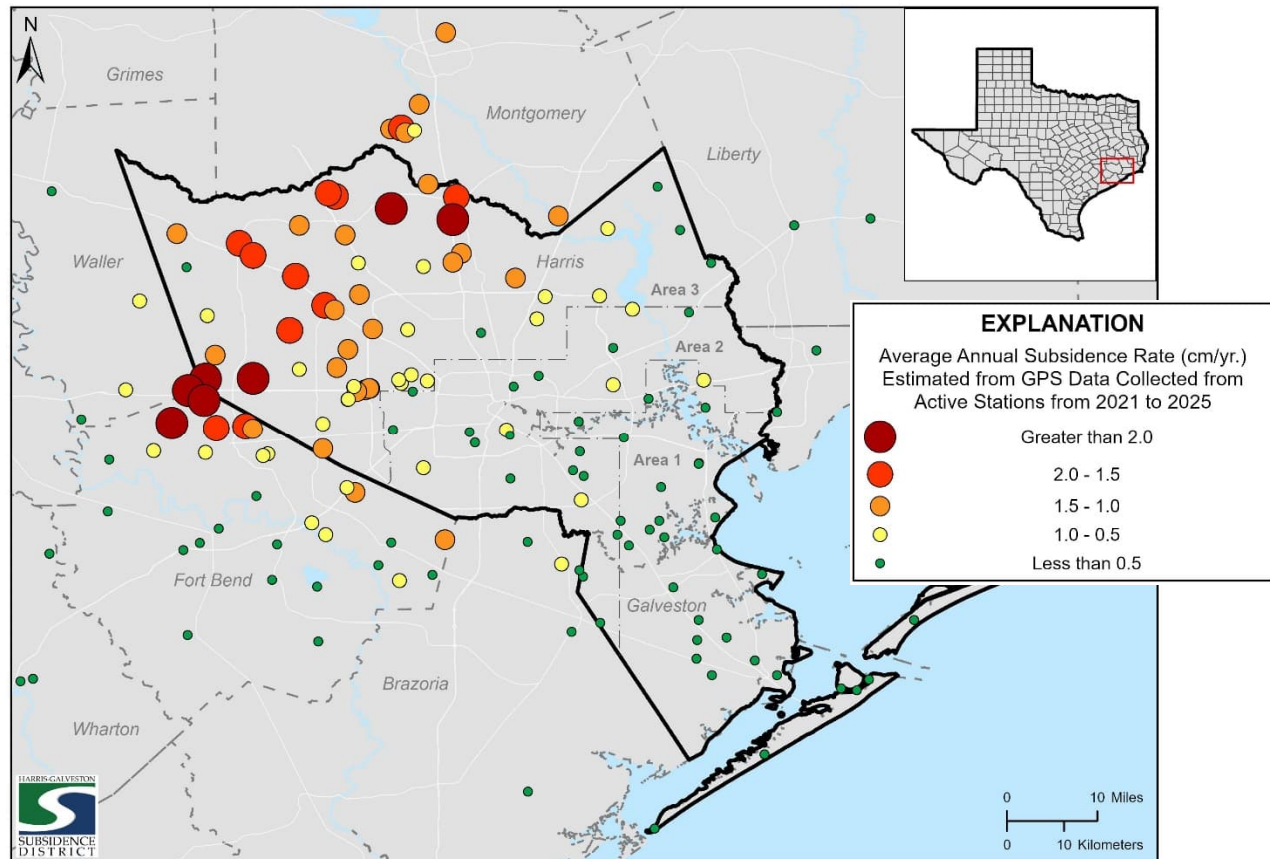


**Figure 5:** Potentiometric water level change at wells screened in the Chicot-Evangeline (undifferentiated) aquifer, Houston region, Texas, from 1977 to 2026 (Source: USGS provisional data – preliminary and subject to change).

## Subsidence

HGSD developed a subsidence monitoring network using global positioning system (GPS) technology to monitor land-surface deformation within and around HGSD. This network involves collaboration among GPS station operators, including the Fort Bend Subsidence District, the University of Houston, the Brazoria County Groundwater Conservation District, the Texas Department of Transportation, and other local entities. In 2025, the subsidence monitoring network collected data from almost 190 GPS stations throughout southeast Texas.

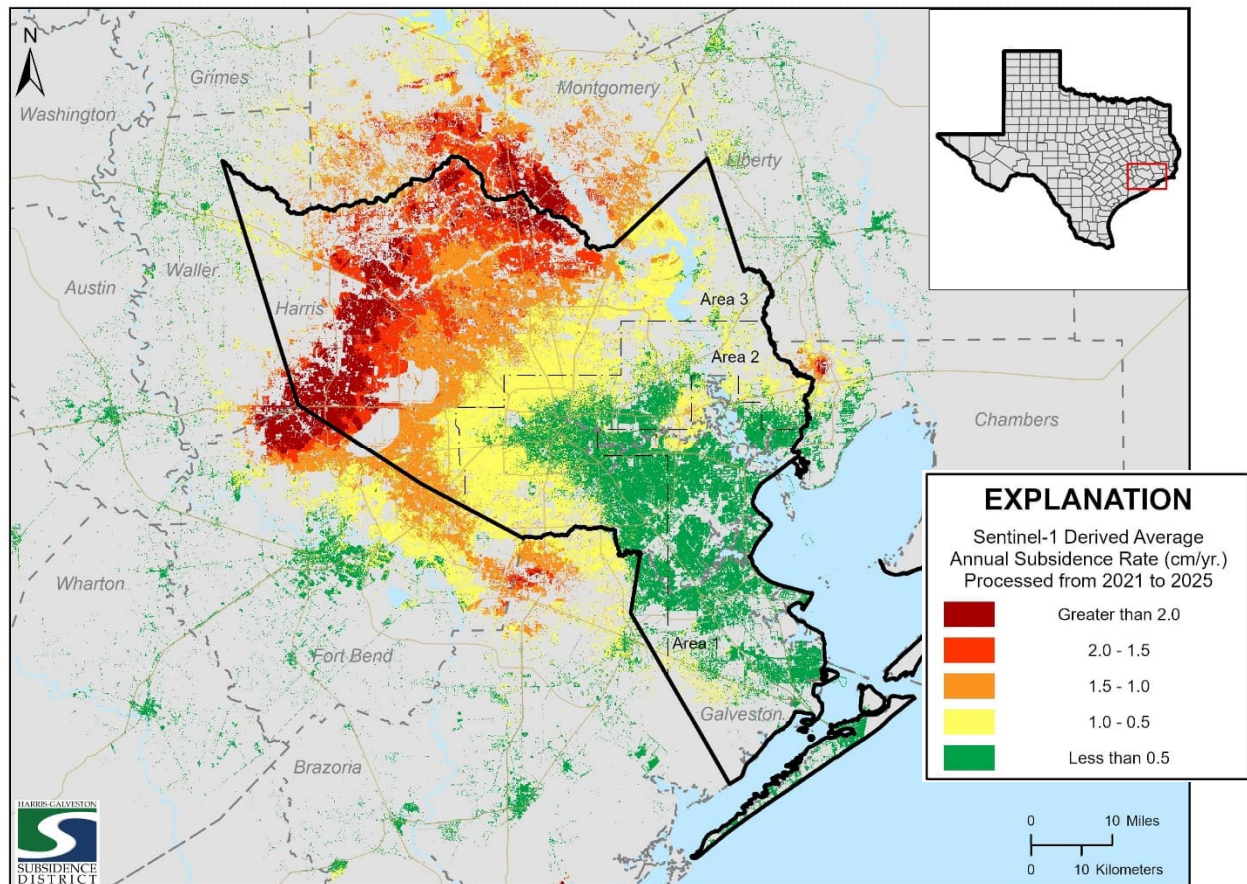
HGSD estimates the average annual subsidence rate as the linear regression of the change in ellipsoidal height (i.e., the vertical movement measured by the GPS stations) over the five most recent years. The subsidence rates observed from 2021 to 2025 in Regulatory Area One are stable, since it has reached the full regulatory conversion requirement, and Chicot-Evangeline (undifferentiated) water levels have risen (**Figure 6**). Subsidence rates are generally above half a centimeter per year throughout Regulatory Area Three, as groundwater remains the primary water source and Chicot-Evangeline (undifferentiated) water levels have declined significantly. The highest subsidence rate was measured at a GPS station in the Katy and Fulshear area, exceeding 3 centimeters per year.



**Figure 6:** Annual subsidence rate, measured in centimeters per year, from 2021 to 2025, referenced to GOM25 and estimated from three or more years of GPS data collected from active GPS stations in Harris, Galveston, and surrounding counties, Texas.

HGSD has sponsored research by Southern Methodist University and industry experts to use another remote-sensing methodology, interferometric synthetic aperture radar (InSAR), to

evaluate land-surface changes in the Houston-Galveston region. InSAR-derived land surface deformation complements HGSD's subsidence monitoring network by providing data in between GPS stations. Results from InSAR-derived subsidence rates closely resemble rates calculated from the GPS stations, such that Regulatory Area One shows minimal subsidence to uplift, whereas western and northern portions of Regulatory Area Three have subsidence rates greater than one centimeter per year (**Figure 7**).



**Figure 7.** Interferometric Synthetic Aperture Radar (InSAR)-derived annual subsidence rate, calculated in centimeters per year, estimated from Sentinel-1 data and averaged from 2021 through 2025.

## Conclusion

The results of the Annual Groundwater Report highlight HGSD's subsidence mitigation efforts. In areas that have reduced reliance on groundwater and fully converted to alternative water supplies, such as Regulatory Areas One and Two, little to no subsidence occurs; whereas Regulatory Area Three and other areas that still rely on groundwater as a primary water source, subsidence continues. Regional collaboration and long-term water planning to provide additional alternative water supplies are vital to minimize subsidence in the region.